

Description

METHOD, SYSTEM, AND STORAGE MEDIUM FOR PROVIDING SEARCH AND REFERENCE FUNCTIONS FOR A MESSAGING SYSTEM

BACKGROUND OF INVENTION

- [0001] The present invention relates generally to messaging systems, and, more particularly, to a method, system, and storage medium for providing search and reference functions for use with a messaging system.
- [0002] Messaging systems such as electronic mail (e-mail) allow computer users to compose messages using a simple text editor and then send these messages to another user. Computer users are also able to send electronic files, graphical data such as spreadsheets and charts, and multi-media data as well. Most online services and Internet Service Providers (ISPs) offer some form of email or messaging capability. With the use of gateways and widely

accepted communications standards such as MAPI and X.400, these users can readily exchange messages with users of other types of messaging systems.

- [0003] When composing or responding to a message, oftentimes the user is required to relate back to a previous message or correlative stored data for a reference or for clarification purposes. This is most often the case in a business context whereby a user is following up on an issue previously initiated or when the user is directed to perform an action item. In this instance, the user is faced with having to search his or her email history folders, local directories, or other sources of electronic data in order to refresh the subject information and recollect the subject matter. Manually searching these data sources can be very time consuming and may not result in locating the desired data.
- [0004] Current messaging systems allow a user to perform administrative functions within the personal email folder such as sorting messages alphabetically by sender, recipient or subject, as well as searching for specific emails by entering a word in the messaging system's search engine. In order to locate a specific message, the user must browse through all or a portion of the messages or perform keyword searches. Moreover, if the user desires to

reference data other than a previous email message (e.g., text file, online document, etc.) for purposes of including the reference data into the email message, the user is required to exit out of the email window and initiate one or more searches of each source location (e.g., local hard drive, online search engine, network drive, etc.). Further, current messaging systems do not allow a user to view and select these search results from within the messaging system and incorporate the search results into the message being composed. In other words, with respect to messaging systems, a user who is composing or responding to a message currently does not have sufficient capability to search for relevant content and incorporate it into the message unless the user first accesses a separate application or search engine.

[0005] Accordingly, it would be desirable to be able to enable a user to access and link relevant data either over a network or from archived sources in the context of creating or responding to electronic messages.

SUMMARY OF INVENTION

[0006] The foregoing discussed drawbacks and deficiencies of the prior art are overcome or alleviated by a method for providing search and reference functions for use with a

messaging system. In an exemplary embodiment, the method includes receiving a request to search a data archive for reference information relating to at least one keyword selected by a messaging system user while the messaging system user is actively engaged in composing a message or a response to a message. The keyword is selected from the body of text contained in the message. The method further includes searching the data archive and, if a reference is found, presenting the reference to the messaging system user within the message itself. The data archive includes information gathered from the messaging system user's message folder and at least one of a local data storage system and a shared online repository. Embodiments of the invention also include a system and a storage medium.

BRIEF DESCRIPTION OF DRAWINGS

- [0007] Referring to the exemplary drawings wherein like elements are numbered alike in the several FIGURES:
- [0008] FIG. 1 is a block diagram of a system upon which the search and reference system is implemented in accordance with an exemplary embodiment of the invention;
- [0009] FIG. 2 is a flowchart describing a process of building an archive of reference materials for use in implementing the

search and reference system in accordance with a further aspect of the invention;

- [0010] FIG. 3 is a flowchart describing a process of composing a message with references implementing the search and reference system in accordance with a further aspect of the invention;
- [0011] FIG. 4 is a flowchart describing a process of viewing and/or responding to a message created using the search and reference system in accordance with a further aspect of the invention;
- [0012] FIG. 5 illustrates a sample computer screen window displaying a message along with search results provided by the search and reference system, in accordance with a further aspect of the invention;
- [0013] FIGs. 6A and 6B are flowcharts illustrating how the process software implementing the systems and methods of the invention may be integrated into client, server, and network environments;
- [0014] FIGs. 7A and 7B are flowcharts illustrating various ways in which the process software of the invention may be semi-automatically or automatically deployed across various networks and onto server, client (user), and proxy computers;

[0015] FIGs. 8A through 8C are flowcharts illustrating how process software for implementing the systems and methods of the invention are deployed through the installation and use of two different forms of a virtual private network (VPN); and

[0016] FIGs. 9A and 9B are flowcharts illustrating how the process software for implementing the systems and methods of the invention can be deployed through an On Demand business model, which allows the process software to be shared and simultaneously service multiple customers in a flexible, automated fashion under a pay-for-what-you-use plan.

DETAILED DESCRIPTION

[0017] Disclosed herein is a method, system, and storage medium for providing search and reference functions for use with a messaging system. The search and reference system of the invention sends a reference link and/or the reference information itself along with the email message. These references are relevant to the subject brought forward in the email message and are obtained by searching keywords selected by the message sender and/or the recipient. The references are prompted to the users when opening the message whereby the users open the refer-

ence document or view the reference text/data. Sources of references include online resources, the sender's local repositories, as well as the recipient's local repositories.

- [0018] Referring initially to FIG. 1, there is shown a block diagram of a network system for implementing the search and reference system. System 100 includes two client systems 102a and 102b in communication via a network connection.
- [0019] Computer devices 102a and 102b may each comprise a general-purpose desktop computer including operating system software, a web browser component, Internet access, and a messaging program such as America Online™, Microsoft Outlook™, or other communications application. Computer devices 102a and 102b may store and execute the search and reference system of the invention, or may access the search and reference system over a network from a service provider. It will be understood by those skilled in the art that the search and reference system of the invention may be executed on computer systems with variant architectures. Client systems 102a and 102b may each comprise various data storage systems. These storage systems are in communication with computer devices 102a and 102b, and refer to any data repository that is

both local to and logically addressable to computer devices 102a and 102b. Email storage 106a and 106b refer to electronic mail storage devices such as, for example, an email folder. Local storage 108a and 108b store data associated with client systems 102a and 102b, respectively, and may include such devices including a hard drive, floppy disk drive, and CD-ROM drive. Data stored in local storage 108a and 108b may include text files, graphical data, and archives of previously generated documents and electronic presentations. Network storage 110a and 110b refer to a data store relating to a local area network associated with client systems 102a and 102 such as an Intranet network, Extranet network, virtual private network, or other similar related storage systems.

- [0020] Client systems 102a and 102b are in communication with a server 104 via network connection such as a T1 line or cable 108 which accesses the Internet or other suitable means of networking architecture.
- [0021] Server 104 comprises a high-powered multiprocessor computer device including web server and applications server software for receiving requests from client systems 102a and 102b to access information via the Internet or other network. Server 104 stores an access control list for

enabling users of different networks to share information online as will be described further herein. Additionally, server 104 may be a resource of information for client systems 102a and 102b aside from the search and reference system of the invention. For example, server 104 may be managed by a business organization that disseminates product information and services over its website and interacts with customers conducting electronic business over the server system. Although only one server is shown in FIG. 1, it will be understood by those skilled in the art that any number of servers or online data sources may be in communication with client systems 102a and 102b when implementing the search and reference system.

[0022] The search and reference system of the invention may be executed as a standalone application that is installed or downloaded on a client system 102a, 102b or may be incorporated into an existing commercial messaging program such as IBM Lotus Notes™, Microsoft Outlook™, and America Online™. Further, the features of the search and reference system may be provided via a third party application service provider (ASP) or e-utilities broker where service is provided for a per-use fee.

[0023] The search and reference system of the invention allows senders and receivers of electronic messages to search and view relevant data, documents, files, etc., that relate to the message being composed, transmitted, and/or responded to. The data searched by the search and reference system is retrieved from one or more of storage systems 106a-b, 108a-b, 110a-b, and server 104. For each client system, the search and reference system builds a data archive of information obtained from these storage systems and makes the data available for the user of each client system when composing or responding to messages. System 100 illustrates the archived data in storage devices 106a-110a for client system 102a, and the archived data in storage devices 106b-110b for client system 102b, respectively. FIG. 2 illustrates the process of building a data archive.

[0024] The process begins at step 202 during initialization of the search and reference system. Any available system data sources are located at step 204. Data sources include Uniform Resource Locators (URLs), web addresses, hypertext links, message addresses, documents, reports, memos, and any other information typically found in data storage. This data reflects past activities conducted by the system

user, information directly transmitted to the system user, and information made available and accessible to the system user. The search and reference system indexes and stores the information for later retrieval at step 206. Indexing may be performed using an indexing generator. Indexing generators are used to organize and classify data and are typically found in application and operating system software. The indexed information is stored to enable quick searches to be performed on keyword(s) as well as to enable analysis on how keywords relate to each other in a textual context. At step 208, the search and reference system determines which, if any, online spaces will be shared with another user. The addressee, such as a message system user on client system 102b, gains access to files through manual choices or preferences defined by the sender. First, the sender is prompted with files to be shared with the addressee, optionally together with a notification of what files are already available to the addressee. If the sender selects such files (not available to the addressee) that he would like to share with the addressee, these files may be automatically stored online in a network place where all parties involved can reasonably access the files. Alternatively, addressees may gain access

to these files on the client system of the sender, provided the addressee can access through the sender's network facilities. Yet another embodiment may refer to online sources where these files can be found, that can be publicly accessed, such as governmental publications. These references of online resources may be stored together with the file information, or may already be available when the user's browser history is searched for related files. The archived data is now ready for use by the search and reference system and the process ends at step 210.

[0025] A user who is preparing to send a message implements the search and reference system of the invention as described in FIG. 3. The process begins at step 302 whereby a user (referred to herein as 'message sender') creates a message at step 304 via client system 102a. A sample message 500 is depicted in FIG. 5. The message sender selects keywords 501 from the body 502 of the message to be searched at step 306. This may be done by highlighting the text to be searched. At step 308, the search and reference system searches one or more of data sources 106a-110a and server 104 for information relating to the keyword(s) selected. The search results 504 for message 500 are displayed within the message window at

step 310. The message sender selects one or more of the results to include in the message at step 312. The message sender has the option of incorporating the reference as a link to be opened by the recipient at step 314, or may select and paste portions or elements of the reference text itself into the current message at step 316.

[0026] At step 318, the search and reference system determines whether the materials selected by the message sender are already available to the recipient (e.g., client system 102b). This may be the case where the reference materials originated from the recipient in a previous communication to the message sender. The search and reference system performs this check by examining the addresses stored in the access control list for the shared online repository 104. If the online repository is publicly available, this check is not required. If the recipient of the message already has access to the reference materials as indicated by the access control list, the message will reflect the reference location where the material may be found. If there are multiple addresses on the message, some of which are without access to the shared online repository 104, the references may be made available by directing the addressees to an online server at step 320. For example,

online repository 104 may be a teamroom as provided by IBM's Lotus Notes™. Selected members of an online community have authorized access to this space. Where all addressees on the message have access to that teamroom, sharing the online space occurs with no problem. However, if one of the addressees does not have access to the online space, the search and reference system may make the documents available in another online space, as provided in step 320, which can be accessed by all addressees. The process then ends at step 322.

[0027] Once the message is transmitted to the recipient, the recipient at client system 102b may access the message utilizing the search and reference system of the invention as described in FIG. 4. The process starts at step 402 whereby a message recipient receives a message with reference materials at step 404. The recipient reads the message text and may access the reference materials in order to obtain additional information. The recipient may also search his or her own repositories 106b-110b via the search and reference system by highlighting the same or alternative keywords in the message body at step 406. The search and reference system performs a search of data sources 106b-110b using these keywords at step

408. At step 410, the results may be integrated into the body of the message as described in steps 310–320 of FIG. 3. In this manner, the recipient may respond to the message sender with additional references or may forward the message to other addressees as desired. The process ends at step 412.

[0028] The search and reference system of the present invention may, as previously described reside on a stand-alone computer system which may have access to the Internet, or may reside on a computer system which is part of the network through which there is Internet access. With a connection to a network and/or the Internet, there are several different ways in which the process software used to implement the systems and methods of the present invention may be integrated with the network, and deployed using a local network, a remote network, an e-mail system, and/or a virtual private network. The following descriptions review the various ways of accomplishing these activities.

[0029] **Integration of Message analysis Software.** To implement the search and reference systems and methods of the present invention, process software, which is composed of the software as described above and related components

including any needed data structures, is written and then if desired, integrated into a client, server and network environment. This integration is accomplished by taking those steps needed to enable the process software to co-exist with other application, operating system and network operating system software and then installing the process software on the clients and servers in the environment where the process software will function. An overview of this integration activity will now be provided, followed by a more detailed description of the same with reference to the flowcharts of FIGs. 6A and 6B.

- [0030] The first step in the integration activity is to identify any software on the clients and servers where the process software will be deployed that are required by the process software or that need to work in conjunction with the process software. This includes the network operating system, which is the software that enhances a basic operating system by adding networking features.
- [0031] Next, the software applications and version numbers are identified and compared to the list of software applications and version numbers that have been tested to work with the process software. Those software applications that are missing or that do not match the correct version

are upgraded with the correct version numbers. Program instructions that pass parameters from the process software to the software applications will be checked to ensure the parameter lists match the parameter lists required by the process software. Conversely, parameters passed by the software applications to the process software will be checked to ensure the parameters match the parameters required by the process software. The client and server operating systems including the network operating systems are identified and compared to the list of operating systems, version numbers, and network software that have been tested to work with the process software. Those operating systems, version numbers, and network software that do not match the list of tested operating systems and version numbers are then upgraded on the clients and servers to the required level.

- [0032] After ensuring that the software resident on the computer systems where the process software is to be deployed is at the correct version level(s), that is, has been tested to work with the process software, the integration is completed. This is done by installing the process software on the clients and servers. Armed with the foregoing overview of the integration activity, the following detailed

description of the same should be readily understood.

[0033] Referring to FIGs. 6A and 6B, step 600 begins the integration of the process software for implementing the search and reference systems and methods of the present invention. It is determined whether there are any process software programs that will execute on a server or servers at step 602. If this is not the case, then integration proceeds to determine if the process software will execute on clients at step 614. If there are process software programs that will execute on a server(s), then the server addresses are identified at step 604. The servers are checked to see if they contain software that includes the operating system (OS), applications, and network operating systems (NOS), together with their version numbers, that have been tested with the process software at step 606. The servers are also checked to determine if there is any missing software that is required by the process software as part of the activity at step 606. A determination is made whether the version numbers match the version numbers of OS, applications and NOS that have been tested with the process software at step 608. If all of the versions match, and there is no missing required software, the integration continues at step 614. If one or more of the ver-

sion numbers do not match, then the unmatched versions are updated on the server or servers with the correct versions at step 610. Additionally, if there is missing required software, then it is updated on the server or servers at step 610. The server integration is completed by installing the process software at step 612.

- [0034] Step 614, which follows either step 602, 608 or 612, determines if there are any programs of the process software that will execute on the clients. If no process software programs execute on the clients, the integration proceeds to step 620 and exits. If there are process software programs that will execute on clients, the client addresses are identified at step 616.
- [0035] At step 618, the clients are checked to see if they contain software that includes the operating system (OS), applications, and network operating systems (NOS) software, together with their version numbers, that have been tested with the process software. The clients are also checked at step 618 to determine if there is any missing software that is required by the process software.
- [0036] At step 622, a determination is made if the version numbers match the version numbers of OS, applications and NOS that have been tested with the process software. If all

of the versions match, and there is no missing required software, then the integration proceeds to step 620 and exits.

- [0037] If one or more of the version numbers do not match, then the unmatched versions are updated on the clients with the correct versions at step 624. In addition, if there is missing required software, then it is updated on the clients as part of step 624. The client integration is completed by installing the process software on the clients at step 626. The integration proceeds to step 620 and exits.
- [0038] Deployment of Message analysis System Software: It should be well understood that the process software for implementing the search and reference system of the present invention may be deployed by manually loading the process software directly into the client, server, and proxy computers from a suitable storage medium such as a CD, DVD, etc.. It is useful to provide an overview of still other ways in which the process software may also be automatically or semi-automatically deployed into one or more computer systems. The process software may be deployed by sending or loading the process software to a central server or a group of central servers. From there, the process software may then be downloaded into the

client computers that will execute the process software. Alternatively, the process software may be sent directly to the client system via e-mail. The process software is then either detached to a directory or loaded into a directory by a button on the e-mail that executes a program that detaches the process software attached to the e-mail into a directory. Another alternative is to send the process software directly to a directory on the hard drive of a client computer. Also, when there are proxy servers, the automatic or self-automatic deployment process will select the proxy server code, determine on which computers to place the proxy servers' code, transmit the proxy server code, and then install the proxy server code on the proxy computer. The process software will be transmitted to the proxy server and then stored on the proxy server. Armed with this overview of the possible deployment processes, the following detailed description of the same with reference to FIGs. 7A and 7B, where the deployment processes are illustrated, will be more easily understood.

[0039] Step 700 begins the deployment of the process software. It is determined whether there are any programs that will reside on a server or servers when the process software is executed at step 702. If the answer is "yes", then the

servers that will contain the executables are identified, as indicated in step 736 in FIG. 7B. The process software for the server or servers is transferred directly to the servers' storage via FTP or some other protocol or by copying through the use of a shared file system at step 738. The process software is then installed on the servers as indicated at step 740.

- [0040] Next, as shown in step 704 in FIG. 7A, a determination is made on whether the process software is to be deployed by having users access the process software on a server or servers. If the users are to access the process software on servers, then the server addresses that will store the process software are identified at step 706.
- [0041] Next, as shown at step 718, a determination is made if a proxy server is to be built to store the process software. A proxy server is a server that sits between a client application, such as a Web browser, and a real server. It intercepts all requests to the real server to see if it can fulfill the requests itself. If not, it forwards the request to the real server. The two primary benefits of a proxy server are to improve performance and to filter requests. If a proxy server is required, then the proxy server is installed as indicated at step 720. Next, the process software for imple-

menting the present invention is sent to the servers, as indicated in step 722 either via a protocol such as FTP or it is copied directly from the source files to the server files via file sharing. Another way of sending the process software to the servers is to send a transaction to the servers that contained the process software and have the server process the transaction. In this manner, the process software may be received by and copied into the server's file system. Once the process software is stored at the servers, the users via their client computers, then access the process software on the servers and copy it into to the file systems of their client computers at step 724. Another alternative is to have the servers automatically copy the process software to each client and then run the installation program for the process software at each client computer. Either way, the user computer executes or causes to be executed the program that installs the process software on the client computer at step 742, then the process exits at step 716.

[0042] Continuing now at step 708 in FIG. 7A, a determination is made as to whether the process software is to be deployed by sending the process software to users via e-mail. If the answer is yes, then, as indicated at step 710,

the set of users where the process software will be deployed are identified together with the addresses of the user client computers. The process software is sent via e-mail in step 726 (shown in FIG. 7B) to each of the users' client computers. Then, as indicated in step 728, the users receive the e-mail, and then detach the process software from the e-mail to a directory on their client computers at step 730. The user then executes the program that installs the process software on his client computer at step 742, and then exits the process at step 716.

[0043] Continuing at step 712 (see bottom of FIG. 7A), a determination is made on whether the process software will be sent directly to user directories on their client computers. If so, the user directories are identified at step 714. Then, the process software is transferred directly to the identified directory on the user's client computer, as indicated in step 732. This can be done in several ways such as, but not limited to, sharing of the file system directories and then copying them from the sender's file system to the recipient user's file system or, alternatively, using a transfer protocol such as File Transfer Protocol (FTP). Next, the users access the directories on their client file systems, as indicated in step 734, in preparation for installing the

process software. Finally, the user executes the program that installs the process software on his client computer at step 742 and then exits the process at step 716.

[0044] Use of Virtual Private Networks for Message analysis System Software: The process software may be deployed, accessed and executed through the use of a virtual private network (VPN). A VPN is any combination of technologies that can be used to secure a connection through an otherwise unsecured or untrusted network. VPNs are used to improve security and can often also reduce operational costs. The VPN makes use of a public network, usually the Internet, to connect remote sites or users together. Instead of using a dedicated, real-world connection such as a leased line, the VPN uses "virtual" connections routed through the Internet from the company's private network to the remote site or employee(s). Access to the software via a VPN can be provided as a service by specifically constructing the VPN for purposes of delivery or execution of the process software (i.e., the software resides elsewhere). In such an instance, the lifetime of the VPN is often limited to a given period of time or to a given number of deployments based on an amount paid.

[0045] The process software may be deployed, accessed, and ex-

ecuted through either a remote-access VPN or a site-to-site VPN. When using a remote-access VPN, the process software is typically deployed, accessed, and executed via the secure, encrypted connections between a company's private network and remote users through a third-party service provider. The enterprise service provider (ESP) sets up and/or authorizes access to a network access server (NAS) and provides the remote users with desktop client software for their computers. The telecommuters can then dial a phone number (often a toll-free number) or attach directly via a cable, DSL, or wireless modem to reach the NAS and use their VPN client software to access the corporate network and to access, download, and execute the process software.

- [0046] When using a site-to-site VPN, the process software is typically deployed, accessed and executed through the use of dedicated equipment and large-scale encryption. These tools are often used to connect multiple fixed sites of a larger company over a public network such as the Internet.
- [0047] The process software is transported over the VPN via a process called tunneling. Tunneling is process involving the placing of an entire packet within another packet and

sending it over a network. The protocol of the outer packet is understood by the network and by both points, called tunnel interfaces, where the packet enters and exits the network. Tunneling generally encapsulates the private network data and protocol information within the public network transmissions so that the private network protocol information appears to the public network simply as unintelligible data. Armed with the foregoing overview of virtual private networks and how they operate and how they may be used to transport the process software, the following more detailed description of same with reference to the flowcharts of FIGs. 8A-8C should be more readily understood.

- [0048] Step 800 in FIG. 8A begins the virtual private network (VPN) process. A determination is made at step 802 to see if a VPN for remote access is required. If it is not required, then flow proceeds to step 804. If it is required, then flow proceeds to step 808 where a determination is made as to whether a remote access VPN exists that is available for use.
- [0049] If a remote access VPN does exist, then flow proceeds to step 810 in FIG. 8A. Otherwise flow proceeds to step 834 (see top of FIG. 8C), where a third party provider that will

provide the secure, encrypted connections between the company's private network and the company's remote users is identified. Next, as indicated in step 836, the company's remote users are identified. Then, at step 838, the identified third party provider then sets up a network access server (NAS). The NAS allows the remote users to dial a phone number (typically a toll free number) or attach directly via a cable, DSL, wireless or other modem to access, download and install the desktop client software for the remote-access VPN as indicated at step 840.

[0050] Returning to step 810 in FIG. 8A, after the remote access VPN has been built or if it been previously installed, the remote users can then access the process software by dialing into the NAS or attaching directly via a cable, DSL, or other modem into the NAS. This step 810 allows entry into the corporate network, as indicated at step 812, where the process software may be accessed. The process software is transported to the remote user's desktop computer over the network via tunneling. During tunneling, see step 814, the process software is divided into packets and each packet, including the data and protocol for that packet, is placed within another packet. When the process software arrives at the remote user's desktop computer, it

is removed from the packets, reconstituted, and then may be executed on the remote users desktop, as indicated at step 816.

- [0051] Returning now to step 804 in FIG. 8A, a determination is made to see if a VPN for site-to-site access is required. If it is not required, then the process exits at step 806. If it is required, flow proceeds to step 820 (see top of FIG. 8B) to determine if the site-to-site VPN exists. If it does exist, then flow proceeds to step 826. If it does not exist, then as indicated at step 822, dedicated equipment required to establish a site-to-site VPN is installed. Then the large-scale encryption is built into the VPN at step 824.
- [0052] After the site-to-site VPN has been built or if it had been previously established, the users access the process software via the VPN as indicated in step 826. Next, the process software is transported to the site users over the network via tunneling as indicated in step 828. As previously explained, the process software is divided into packets and each packet including the data and protocol is placed within another packet, as indicated in step 830. When the process software arrives at the remote user's desktop, it is removed from the packets, reconstituted, and is executed on the site users desktop at step 832. The process then

proceeds to step 806 and exits.

[0053] On Demand Computing for Message analysis System Software: The process software for implementing the search and reference system of the present invention may be shared; that is, it may be used to simultaneously serve multiple customers in a flexible, automated fashion. It is process software that is easily standardized, requiring little customization, and it is scalable, thus providing capacity on demand in a pay-as-you-go model known as "on demand" computing. An overview of on demand computing as applied to the search and reference system software will now be provided, followed by a more detailed description of same made with reference to the flowcharts of FIGs. 9A and 9B.

[0054] The process software for implementing the present invention can be stored on a shared file system accessible from one or more servers. The process software may be executed via transactions that contain data and server processing requests that use measurable CPU units on the accessed server. CPU units are units of time such as minutes, seconds, and hours on the central processor of the server. Additionally, the accessed server may make requests of other servers that require CPU units. CPU units

are an example that represents but one measurement of use. Other measurements of use include, but are not limited to, network bandwidth, memory usage, storage usage, packet transfers, complete transactions, etc.

[0055] When multiple customers use the same process software application, their transactions are differentiated by the parameters included in the transactions that identify the unique customer and the type of service for that customer. All of the CPU units and other measurements of use that are used for the services for each customer are recorded. When the number of transactions to any one server reaches a number that begins to affect the performance of that server, other servers are accessed to increase the capacity and to share the workload. Likewise, when other measurements of use such as network bandwidth, memory usage, storage usage, etc., approach a capacity so as to affect performance, additional network bandwidth, memory usage, storage etc. are added as needed to share the workload.

[0056] The measurements of use used for each service and customer are sent to a collecting server that sums the measurements of use for each customer for each service that was processed anywhere in the network of servers that

provide the shared execution of the process software. The summed measurements of use units are periodically multiplied by unit costs and the resulting total process software application service costs are alternatively sent to the customer and or indicated on a web site accessed by the customer who then remits payment to the service provider.

- [0057] In another embodiment, the service provider requests payment directly from a customer account at a banking or financial institution. In yet another embodiment, if the service provider is also a customer of the customer that uses the process software application, the payment owed to the service provider is reconciled to the payment owed by the service provider to minimize the transfer of payments. Armed with the foregoing overview, the detailed description of the on demand computing with respect to the process software, and the following detailed description of same with reference to FIGs. 9A and 9B where the on demand processes are illustrated, will be more easily understood.
- [0058] Step 900 begins the On Demand process. A transaction is created that contains the unique customer identification, the requested service type and any service parameters

that further specify the type of service as indicated in step 902. The transaction is then sent to the main server as shown in step 904. In an On Demand environment, the main server may initially be the only server. Then, as capacity is consumed, other servers are added to the On Demand environment.

- [0059] The server central processing unit (CPU) capacities in the On Demand environment are queried at step 906. The CPU requirement of the transaction is estimated, then the servers' available CPU capacity in the On Demand environment are compared to the transaction CPU requirement to see if there is sufficient CPU available capacity in any server to process the transaction as indicated in step 908. If there is not sufficient server CPU available capacity, then additional server CPU capacity is allocated to process the transaction as indicated in step 916. If there was already sufficient available CPU capacity, the transaction is sent to a selected server at step 910.
- [0060] Before executing the transaction, a check is made of the remaining On Demand environment to determine if the environment has sufficient available capacity for processing the transaction as indicated at step 912. This environment capacity consists of elements such as, but not lim-

ited to, network bandwidth, processor memory, storage, etc. If there is insufficient available capacity, then capacity will be added to the On Demand environment as indicated in step 914. Next the required software to process the transaction is accessed, loaded into memory, and the transaction is executed as indicated in step 918.

- [0061] The usage measurements are recorded as indicated in step 920. The usage measurements consist of the portions of those functions in the On Demand environment that are used to process the transaction. The usage of functions such as, but not limited to, network bandwidth, processor memory, storage and CPU cycles are what is recorded. The usage measurements are summed, multiplied by unit costs, and then recorded as a charge to the requesting customer as indicated in step 922.
- [0062] If the customer has requested that the On Demand costs be posted to a web site as indicated in step 924, then they are posted to a web site at step 926. If the customer has requested that the On Demand costs be sent via e-mail to a customer address as indicated in step 928, then they are sent to the customer via e-mail as indicated in step 930. If the customer has requested that the On Demand costs be paid directly from a customer account at step 932, then

payment is received directly from the customer account at step 934. The On Demand process proceeds to step 936 and then exits.

[0063] As will be appreciated from the above description, the restrictions and limitations that exist with current messaging applications are efficiently overcome. The search and reference system of the invention enables a search to be performed for relevant information during the creation of, or response to, an electronic message. The available material in the message text provides the context for searching for related information. Relevant search results are provided to both the email sender and receiver within the message text. The message composer and/or recipient may then select from the relevant search results and enter it into the current message or use in preparing a message response.

[0064] As described above, the present invention can be embodied in the form of computer-implemented processes and apparatuses for practicing those processes. The present invention can also be embodied in the form of computer program code containing instructions embodied in tangible media, such as floppy diskettes, CD-ROMs, hard drives, or any other computer-readable storage medium,

wherein, when the computer program code is loaded into and executed by a computer, the computer becomes an apparatus for practicing the invention. The present invention can also be embodied in the form of computer program code, for example, whether stored in a storage medium, loaded into and/or executed by a computer, or transmitted over some transmission medium, such as over electrical wiring or cabling, through fiber optics, or via electromagnetic radiation, wherein, when the computer program code is loaded into and executed by a computer, the computer becomes an apparatus for practicing the invention. When implemented on a general-purpose microprocessor, the computer program code segments configure the microprocessor to create specific logic circuits.

[0065] While the invention has been described with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited

to the particular embodiments disclosed for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims.

[0066] What is claimed is: